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ON THE EFFECTS

OF THE

THERMAL WATERS OF EMS

BY

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ON THE

MEDICINAL EFFECTS

OF THE

THERMAL WATERS OF EMS.

Physicians of watering-places not unfrequently fall into the error of attributing to the waters of their respective springs as many curative qualities as possible. It must, however, be considered much more serviceable both to patients and their medical advisers, that the classes of maladies for which the mineral is indicated, as well as the various circumstances under which it may be prescribed, should be accurately

specified. Certainty of effect in a *few* diseases, is assuredly to be preferred to uncertain or ambiguous operation in many. It is not the object of the present work to laud the waters of Ems as a universal panacea; on the contrary, in enumerating the forms of disease suited to these waters, it is my wish to simplify the catalogue as much as possible, — and in this respect, I confess, I had rather do too much than too little. A physician practising at a watering-place ought to do everything in his power to facilitate a choice of such importance, as that of a medicinal spring; an object hardly to be attained by expatiating *(more majorum)* on its marvellous effects; or, in an equally reprehensible spirit, by indulging in hyperbolical tirades about the intimate and subtile blending of the components in mineral waters, and the peculiar nature of their warmth, — but rather by giving a *concise*, decisive, and *empirical* account of the effects of his particular spring, — when bene-

ficial, when indifferent, when hurtful — in those morbid conditions for which by its chymical analysis it would seem to be indicated; thus correcting and determining *a posteriore* the indication obtained by empirical means.

Mineral springs are to be looked upon as compound medicaments, at a knowledge of which we can arrive only by experience and experiment. Both these sources of information are to be subjected to scientific investigation and *all deductions* must repose on the foundation of *modern physical science;* under the influence of this healthy spirit the puerilities so often met with in treatises on mineral waters will soon find a well-merited exposure, and scientific observations will no longer be disfigured by the additament of coquetish sciolism.

By reason of the decided predominance of bi-carbonate of Soda in their composition, the springs of Ems are to be classed among the earthy-alkaline Thermals, (Soda-Thermals), and

vary in temperature from 66° to 100° Fahr. In addition to the bi-carbonate of Soda, their principal ingredients are: Carbonic Acid, Carbonate of Magnesia, Carbonate of Lime, Muriate of Soda, Muriate of Magnesia, Muriate of Lime, and a small proportion of Sulphate of Soda. The other components exist in too small quantities to be of any effect in the operation of the water.

The components enumerated above, are sufficient to dissipate and destroy whatever fanciful hypotheses may have been framed on this subject. Alkalies, Soda, are as we have seen, preponderating elements in the Thermals of Ems, and among all the constituents of the *materia medica*, alkalies are assuredly those to which a purely chymical operation on the organism may with the greatest propriety be ascribed. Thus it is on the acid-destroying and liquefying (discussing) properties of alkalies in general, that an explanation of the effect of the Ems waters

must be based. But, though this liquefying and acid–destroying effect is unquestionable, yet it cannot be denied that many diseases against which our waters are employed, are with regard to their inward nature too imperfectly known for the curative process to be attributed solely to the above–mentioned effects. The time has now passed, when in pharmacological writings empty theory was substituted for physiological operation. The works of the better class of modern authors have demonstrated, that the physiological effects of remedies may be studied *empirically*, and that critical empiricism furnishes the best theory for their therapeutic employment.

If, in accordance with these premises, I consider our waters in their totality as a medicament, in a *clinical point of view*, it appears that it is principally against *one large class of diseases* that they are actually serviceable. Just as other remedies exhibit their peculiar efficacy in one form of disease, as for instance mercury in

Syphilis, iodine in Scrofula, and quinine in intermittent fever, so do the Soda-thermals of Ems act against *chronic Catarrh*, without however being absolutely excluded from other spheres of action; and as the agents alluded to are advantageously employed in a number of other diseases, the same rule holds good with the waters of Ems. A satisfactory explanation of this is beyond my power, for the reasons of their agency are as little known as that of mercury in Syphilis, or quinine in Intermittent.

All the cures hitherto effected at Ems may be comprehended under the rubric of *chronic catarrh*, and this view of the subject at once explains why, in cases apparently identical, Ems should in one instance prove serviceable, and in another of no avail. Only chronic catarrhs are curable by these waters! But symptomatic Medicine has described all the symptoms and all the sequent phænomena of catarrhs as independent diseases, and thence it is that Asthma, which

as a consequence of chronic catarrh of the chest may be cured by Ems, has so often not met with success in seeking a cure at this place. In such cases, the asthma was a symptom of another disease resting on a totally different anatomical basis than on catarrh of the mucous membrane. For this reason *anatomical diagnoses* are now a matter of necessity.

Catarrhs are hyperhæmias of the mucous membranes and their follicular apparatus, with abnormal nourishment of the same, and abnormal secretion. When the affection becomes chronic, it leads to hypertrophies, infiltrations of the submucous cellular substance to wasting and enlargement of the follicles, to epithelial cumulations, to ulceration, to relaxation of the submucous cellular tissue and the muscular bundles, which occasion passive enlargements in the canal or the cavity. If therefore we take into consideration the anatomical extent of the mucous membranes, that they line the organs of digestion and respi-

ration and stretch, as accessories, to the eyes and ears, and to the cavities of the fauces and forehead; — that they form a coat over the urinary and genital organs; that the lacteal ways and the external auditory passage are lined with mucous tunic; if we moreover think of the variety of sympathies existing between the pituitary membranes and other organs, we may easily account for a mass of phænomena, as consequences of disturbed function and secretion. Besides these, there appear in disorders of the mucous membrane a multitude of reflected influences in those portions of the muscular system which are physiologically connected with the mucous surfaces. On account of the sensitiveness of the diseased mucous membrane, these reflexes are not only easily occasioned by external agencies, but also take place spontaneously; in frequent repetitions at first, in consequence of simple irritation of the part; — at a later period, in consequence of large accumulations of exsuda-

tions (exsuded matter) or of recidivous hyper-hæmia. In such cases the whole constitution is often attacked, for these chronic catarrhs are mostly serious affections, that disturb the whole animal economy; they cause general indisposition, loss of substance, prostration of strength, and evening exacerbations. By all this, a mass of pathological forms may be produced, such as indeed ontological Medicine has created.

Some have even gone so far, as completely to overlook the local affection and to classify such diseases with the greatest diversity, — as coming under the head of retentions, catarrhs, blennorrhœa, rheumatic, gastric, idiopathic fevers, nay, even of nervous diseases. This has naturally given rise to numerous mistakes in distinguishing diseases, and morbid conditions of the most different kinds have been treated in Ems; but only in *chronic* catarrh have cures been effected; the other cases, however analogous, have almost caused Ems to lose its well-

deserved reputation as a remedy against catarrh. There exist, it is true, catarrhs of such a nature as not to meet with a cure in Ems, because they are altogether incurable. In this class are comprehended those which attend a disordered state of the blood, Bright's disease, scurvy, secondary Syphilis, drunkards' dyscrasy, and the like; in such cases the catarrh is continually renewed by the chymically changed composition of the blood, which our waters are unable to restore to a normal state; and it may here be remarked, that there is as little hope in Ems for those instances of catarrh which are based on a state of *central* disease. Should, however, the original dyscrasy have been removed, yet without procuring the cessation of the catarrh, the latter having become habitual, and having constituted itself an independent disease, *then it is that Ems may be used with advantage.*

Foremost in the catalogue of the catarrhs curable at Ems are to be placed those of the

mucous membrane of the respiratory organs; and these it is, that have made the reputation of our watering-place. Protracted and neglected acute catarrhs without dyscrasic basis, or change of structare or tissue, allow of a decidedly favourable prognosis. But, if pathic deposits should be the cause of continual irritation of the respiratory mucous membrane, the prognosis will be less auspicious, and should there be fever, our waters are counter-indicated. When, however, the pathic deposits have ceased, and a chronic catarrh remains behind as an independent disease, in which the patient continues in the same sickly state as in his former complaint, so that to the unprofessional, the original disease seems even aggravated; — in such cases Ems will prove beneficial in curing, not the primary malady, but the secondary one, which by duration and intensity had become independent. And as, on the one hand, the pathic product continually gives rise to renewed catarrhs, so, on the other, the

long duration of the catarrh occasions fresh de-posits of pathological products which, according to the laws of analogous formation, soon assume the character of the first exsudation. For this reason, too much care cannot be bestowed on every hyperhæmia, on every catarrh that shows a disposition to prove obstinate. If we succeed in curing this catarrh, we put a stop to the pro-gress of the previous pathological process, as for instance, *Tubercles*. Thus, in Ems it is not the tubercles that we cure, — but the chronic catarrh, the exciting cause, the dangerous atten-dant and successor of tuberculosis. Ems can no more be regarded as a certain remedy in tuber-culosis, than the formerly so highly lauded spe-cifics can be looked upon as such; in fact, there exists no remedy, of which we can say with any degree of certainty, that it removes or re-solves tuberculous deposit, that it eradicates dys-crasy, or even acts on the diminution or cica-trization of the caverns. From the foregoing, it

becomes evident *when* and *how* assistance is to be expected from Ems, and if we adhere to these principles, it will not be necessary to send the patient hither *on trial.*

The remarks made in the instance of Tuberculosis apply with equal force to *Emphysema*, bronchial enlargements, hoarseness, pertussis etc. and consequently all the diseases of the symptomatic school referred to above, all the confused nomenclature of maladies and symptoms, whether with obsolete or modern titles, fall at once to nothing.

If we make accurate anatomical and physiological diagnoses, we may banish all those terms which convey no idea, and have served but to produce unspeakable mischief and confusion in balneological literature.

The second class of chronic catarrhs curable in Ems, are those of the digestive mucous membrane. This latter covers the interior of the mouth and the tongue, the palate, and the sali-

vary ducts, the cavity of the pharynx, lines the alimentary canal, the stomach, and the intestinal canal, the biliary ducts, the gall-bladder, and the pancreatic duct; it is comprehended under the general name of gastro-intestinal mucous membrane. The eminent part it has played in pathological science since Broussais' time requires no farther mention here; it is subject to frequent disorders, and the so-often occurring catarrhs of this tunic constitute an important province for the operation of the Thermals of Ems. Here again symptomatic and ontological Medicine has called into existence a mass of names, sufficient to make one's hair stand on end.

Obstructions in the abdominal intestines, inert circulation of the blood in the port-vein system, augmented venosity, abdominal plethora; bleeding, blind, and mucous hemorrhoids, obstructions, scirrhosities, genuine and supposed infarctions, accumulations of mucus, dyspepsia etc. If these morbid conditions be analysed, those in which

Ems has proved serviceable will be confined to chronic catarrhs; and the uncertainty of the curative result is also in this case to be accounted for by the want of *anatomical diagnoses*. It is in point of fact, chronic catarrhs of the fauces, the stomach, the duodenum, the jejunum; chronic Typhlitis and Colitis; chronic catarrh of the rectum, that are meant by the mystical terms cited above, and these are the diseases suited to the waters of Ems. In consequence of previous hyperhæmias and frequent catarrhs the textures of the stomach and intestinal duct become indurated, and this takes place not only with the mucous membrane, but also with the submucous cellular tissue. This inspissation (concretion?) and induration, which is the occasion of so many abdominal disorders, is most effectually brought to liquefaction and absorption by the *Soda* of Ems. It is to this effect that the fame of the Ems waters for improving the appetite is to be attributed; it puts a stop to the

emaciation always attendant on these cases, and frees the patient from the distressing symptoms of head-ache, sleeplessness, oppression, previshness, and disposition to hypochondria, not because Ems is indicated for hypochondria, but because it cures the chronic catarrhs of the intestinum. —

The two large glands of the abdomen, the *liver* and the *pancreas*, stand in intimate connection with the intestinal canal, into which their secretions are discharged; the gall-bladder, the common biliary duct, the hepatic and gall-bladder duct, and even the minute branches of the biliary are lined with a mucous membrane, and thence subjected to the affections of the mucous system; they also participate frequently in the disorders of the intestinal pituitary tunic. To this point I wish to direct particular attention, namely, that Ems may be considered an excellent remedy *in those diseases of the liver, which are contingent on affections of the mucous membranes*

connected with that gland. Such are mostly of a chronic nature, produced very often by diseases of the neighbouring organs, as of the stomach, and among the intestines especially of the duodenum; most of the chronic intestinal disorders being complicated with abnormities of the liver. In the generality of these diseases carbonates of alkalies, particularly that of soda, combined with a considerable quantity of warm water have been found serviceable, and the forms in which the peculiar advantages of Ems are displayed, are *catarrhal inflammations of the gall-bladder and the common biliary duct,* which frequently occur as independent disorders, and are often occasioned by gall-stones or too irritating gall. In these instances our soda-thermals, as they promote the biliary secretion, are, in conjunction with warm baths, highly efficacious; their effect is excellent also in Polycholia, Fatty Liver, and biliary calculi. It is particularly against fatty liver, of so frequent

occurrence, especially in Tuberculosis, that our warm soda-springs are of use, not only by their increasing the secretion of bile, but also by the possibility of their producing a saponification of the fat in the liver. The waters of Ems, by removing the chronic catarrh of the air-passages, of the stomach, and the adipose infiltration of the parenchyma of the liver in Tuberculosis, undoubtedly render essential service in this disease; they improve the constitution and the nutritive process, and thus contribute indirectly to checking or even to healing the tubercles. — The third class of diseases for the cure of which these waters are adapted, comprehends the *chronic catarrhs of the urinary and generative organs.* The mucous membrane of the bladder, sometimes that of the ureters and pelvis renum, is also subject to blennorrhœa, nor is catarrhus urethræ an unfrequent phænomenon. Should the complaint not be referable to a syphilitic or dyscrasic origin, and if ulceration has not yet

commenced, these troublesome disorders are likely to find a curative medicament in the waters of Ems.

To this category belongs the numerous group of diseases for which Ems is specially indicated, and to which it is not less indebted for its reputation, than to diseases of the chest. The class referred to, comprises the disorders peculiar to the female sex. It is true, almost all mineral springs claim to be considered as *specifica* in these diseases, and I willingly give each its due. My object here is only to particularize the cases which are be looked on as amenable to the forum of Ems. —

In this category we may mention in preference those *blennorrhœas of the genital mucous membrane* that have not a dyscrasic and specific foundation; *chronic catarrh of the uterus and vagina*, which presents itself idiopathically, and is to be distinguished from the symptomatic, the puerperal, the virulent, the metastatic, and the constitutional.

These secondary forms require the treatment of the primitive disease, and then gradually disappear; this favourable issue does not, however, always take place, and often the pathological secretion of the uterus becomes so habitual, as to continue after elimination of the originating disease. Under such circumstances a methodical course of waters at Ems may prove all the more beneficial, from its affording an opportunity to effect a total change in the patient's habits and mode of life. It is an undeniable fact that our springs exercise a special influence on the uterine system, and are particularly to be recommended where an increase of the *congestive state* is aimed at, as is frequently the case in *torpor*, and in *viscous* and *scanty* secretions. —

The mucous membrane of the uterus stands in the most intimate anatomical connection with the substance of that organ, so that disorders of this *mucosa* often lead to diseases of the substance, particularly after delivery. It is gene-

rally from that epoch that are to be dated *chronic infarctions of the uterus*, against which we possess a most effective remedy in the *natural ascending Douche*, termed the „Bubenquelle.“ The most considerable *indurations* yield to an energetic and continuous application of the large *douches ascendantes*, and the attendant dysmenorrhœa or amenorrhœa is removed by a methodical use during a few weeks.

At the age of puberty, the uterus undertakes the periodical excretion of a sanguineous fluid, conditional on hyperhæmia of the ovarium and the bursting of one of *Graaf's* follicles. In this hyperhæmia the pituitary tunics of the tubes and the uterus participate in a high degree, and thereby proximately effect the sanguineous secretion. At this crisis a variety of irregularities occur, and it is particularly the diseases mentioned above, *chronic catarrh* and *infarctions of the uterus*, that occasion these abnormities in the catamenial period. Such are more espe-

cially, *uterine colic*, *dysmenorrhœa*, and *torpid amenorrhœa*. In these conditions, when not dependant on anæmia or hydræmia, our springs render excellent service — particularly in the form of baths and the warm uterus-douche.

These uterine colics occur moreover in many diseases of the uterus, especially in Fibroids, fibrous Polypi, and changes in the configuration; in all these forms our baths are exhibited with the greatest success, but constitute only an important accessory to the *regular* treatment.

A very frequent and in the highest degree distressing disease of the uterus is, *cancer*. In such cases the physician's principal object will be, to relieve the severe attacks of pain, which deprive the patient of sleep and rapidly wear down the constitution. In this malady our baths have a *sedative* effect that continues for a lengthened period, and far surpasses the operation of opium. Of late, several cases have

occurred in which this effect has been manifested also in *carçinoma* of the *mamma*.

It would be improper to pass over in silence the great renown of Ems as a remedy for *sterility*. Without farther allusion to extravagant theories on this head, it will suffice to state that, both with the water and the natural douche *(Bubenquelle)* the operation is, to remove the diseases described above, and thus to render conception possible. It is therefore self-evident, that only *conditionally* can our famous douche be productive of maternal joys; but it must be allowed that this effect of the waters of Ems in a certain degree justifies the encomiums of which they have been made the subject.

Such are the diseases which, in a clinical point of view, may meet with a cure at Ems. But there exists another class of maladies in which Ems is resorted to from chymiatric views.

Under this head are comprised those diseases

where we either find an acid as the morbid product, or suppose one as the cause of disease. It is a natural consequence, that against complaints arising from such a cause, the acid-destroying soda-springs of Ems should be of peculiar efficacy. In this class we have to enumerate *Scrofula*, *Gout*, *Rheumatism*, *urinary Gravel and Stone*, and *Hæmorrhoids*, in which diseases the curative object is said to be, by the introduction of an abundance of bi-carbonate of soda and the union of the same with the peccant matters in the blood, to operate on the chymical composition of this fluid and to restore it to a normal state. But the existence of these peccant matters in the blood has not hitherto been demonstrated! For, though an acid reaction of the blood may often exist, as in *Scherer's* discovery of free lactic acid in puerperal exsudations, or in *Verdeil's* exhibition of a peculiar pulmonary acid, yet the facts are till now too isolated to be available for practice,

and then it is not to be forgotten that the parenchymatous fluids of the spleen, muscles, liver etc. all contain a free acid. The *existence* of an *acid diathesis* in the blood is, therefore, as yet an *hypothesis*, although it cannot be denied that certain therapeutic results speak in its favour. It may, consequently, be assumed, that our mineral is serviceable in *Scrofula* and *Gout*, but not in every form, — not in the most delicate cases, — but rather as a preparatory and subsequent treatment. And if such cases be subjected to strict investigation, it will generally be found that the predominant symptoms are to be referred to the *pituitary system*, or, in other words, to *chronic catarrhs*.

It is, in addition, to be remarked that the idea attached to *Scrofulosis* is as indefinite as that of chronic *Rheumatism* and *Gout*. Indeed, the idea of these diseases is so vague, that were it for the present entirely set aside, Science would perhaps gain thereby. All phi-

losophical, *a priori* explanations of morbid processes, such as those attempted by the organic-chymical School, have for the most part come to nothing; a failure, which may be attributed to a belief of its being possible to give a fresh impulse to Medicine, without physiology and pathological anatomy, but by a one-sided system of subjective chymical views. The employment of our Thermals in arthritic exsudations rests on the supposition of a uric diathesis. Even if by this use of the minerals the acid of the gastric juice should be saturated, and uric acid resolved, yet it will scarcely happen that an arthritic patient will thereby be *cured.* Diet, exercise, and change of habits, are to be considered as the chief agents, and whatever we may be able to effect in the way of resolution, will take place in the least objectionable manner by means of that first of all resolvents — *water.* The same remarks are applicable, with regard to the preponderating formation of

uric acid in Stone and Gravel. It is known that with patients of this description disorders of the bladder have often disappeared here; and it is more particularly the *catarrh* of the bladder, so common in calculous complaints, and the producer of pain and cramps, that is removed by the use of our soda-springs. There are, however, concretions consisting of phosphates and oxalates, which are counter-indications for the exhibition of our thermals, inasmuch as their employment would create fresh deposits and increase the size of the stones. On this point more ample investigations are decidedly necessary. Chymical therapeutics do not as yet furnish us with a sufficiency of facts, nevertheless this *chymiatric* point of view is by no means to be underrated; for it must be the endeavour of exact balneology satisfactorily to explain the operation of a mineral with reference to its components. These are however *pia desideria*; scarcely has even the task been commenced!

Let us hope that Time will throw more light on this subject; but, for the present, we have uncertainty enough, to enable us to dispense with all farther hypotheses! —

With regard to what are termed Hæmorrhoids, we have to understand very complicated conditions proceeding from the most various diseases, — a word that is the scape-goat of so many practitioners for a superficial diagnosis and system of therapeutics, — a word to which almost every physician attaches a different signification, and gives a different explanation. It would therefore perhaps be better to abandon this term entirely to *popular medicine*. Without speaking of other defects of the heart, how often are those states of disease called Gout and Hæmorrhoids to be attributed to faults in the valves! Such disorders grow worse in Ems; — we must therefore form anatomical diagnoses, and not adopt words that convey no positive idea! —

As for other dyscrasies reported to have found a cure at Ems, such as Diabetes mellitus, Dropsy, and Adiposis, any farther mention of these will be unnecessary, for such cures belong to the regions of fable, and exist only on paper. —

In many other forms of disease Ems has a curative effect in common with *various Thermals;* it is not necessary to enumerate them, as the preceding observations indicate sufficiently what forms are here alluded to.

Although the fore-going remarks would confine the efficacy of our springs within narrower limits than are generally accepted, but yet these limits enclose a spacious field of action, while the bases of operation are much more certain: the sanative efficacy of the Springs of Ems comprehends the *whole system* of the *mucous tunics* in its idiopathic disorders, and consequently comprises *chronic catarrhs.* And when pathological anatomy and physiology go hand in

hand with clinical observation, and take the place of that mystical bombast regarding mineral waters which has been so deservedly ridiculed, — then may medicinal Baths be looked upon as *clinica* on an extensive scale, and in compliance with the urgent demands of our time, *as physiatrical clinica.*

To many, this *clinical* or, as it were, pathologic-anatomical point of view, may appear too exclusive, as it is difficult to be acted on in hospital practice, but with respect to balneological Medicine *too* decisive views cannot be entertained, if order is to be restored, for it is exactly from according too much consideration to constitutional and ætiological circumstances that so much vagueness and confusion have been introduced into balneological literature. These noxious circumstances ought, it is true, not to be overlooked; but again I repeat, that in the existing state of things rather *too much* than too little must be done! A new opinion, if it

is to have any value in the eyes of the medical profession, must not only be founded on reliable experience, but must be presented in the most positive and decisive form, for how can it otherwise expect to be noticed among the mass of absurdities and platitudes that are continually published on these subjects. Anatomical diagnoses and a thorough chymical knowledge of the curative means are therefore of primary importance if the errors of old are to be avoided! For, the more firmly we establish *anatomical diagnoses* for Ems, duly appreciating the chymical i. e. material curative apparatus, — the greater will be the benefit both to the patients and to science. —

The nature of the subject has compelled me, in the foregoing remarks, to mention much that is by no means new. But the main object of these pages is to protest against an abuse that has prevailed for years, namely that of crying up our waters as a remedy for every possible

disease. This has been carried to such a height in several publications on medicinal waters, that the diseases enumerated as objects of the sanative efficacy of the respective spring might have furnished the index of a work on special therapeutics. There can be no doubt that during the treatment of various obstinate cases a visible improvement has taken place, and the physician of the place, attributing this desirable change *exclusively* to the efficacy of his spring, immediately sets about extolling the water in question as an infallible panacea for the disease referred to. It is, however, well known at the present day that, during a course of mineral waters a number of dietetic, gymnastic, physical, and psychical influences, simple in themselves but powerful by simultaneous operation, are called into play; and while reporting the favourable results of a course, practitioners would do well not to over-rate the effects of their minerals, to which often but a small share of

credit is due. This want of discernment it is, that has brought this description of literature into so bad an odour! In similar publications *truth* and *conscientiousness* are primary requisites, and these qualities are but too often wanting since medicinal springs have become objects of speculation and competition. Nothing, too, can be more impolitic than crying down another spring from motives of jealousy; let us rather by strict particularisation, by exact indications appreciate its excellencies and set its value in a true light. Water has become a fashionable remedy; and as no such remedy answers all expectations, so it is too with water. Yet there is nothing on the face of the earth that can prove more frequently serviceable, even if it comes into fashion, than water, „*water is the best of all*“, says Pindar. The times are not distant when mercury was the universal medicament; now we have all sorts of mystical remedies, and peering above the

water we may discover even a faith in miracles.

I have endeavoured to confine the sphere of action to be attributed to the Thermals of Ems within the narrowest limits possible, to the end that disappointments, injurious equally to the expectant patient and to the reputation of the springs, may be avoided: and it would afford me the liveliest satisfaction to know that I had succeeded in presenting the subject in a clearer light, and in giving a more *definite* shape *to inquiry.*

THE

THERMAL WATERS OF EMS

AS A REMEDY IN

EMPHYSEMA OF THE LUNGS.

The repute our thermal Springs have obtained in cases of chronic affections of the chest seems to be so well-founded, as to render any farther remark on the subject totally superfluous. These chronic affections of the respiratory organs were formerly thrown into one category, under the names of chronic inflammation of the pulmonary substance, of the parenchyma, weakness of the chest, pulmonary consumption,

catarrh of the laryngial mucous membrane, hæmoptysis, asthma, accumulations of mucus, decline, mucous obstruction in the lungs, mucous consumption, narrowness of the chest and the like. That these appellations serve a gross *ontology* for the purpose of display, need scarcely be mentioned; they denote only symptoms which may belong to the most different morbid procedures. Hence it has arisen that, the symptom being taken for the disease, maladies the most opposite have frequently been subjected to the same treatment; a course of proceeding which, as may be supposed, resulted sometimes in a favourable, sometimes in an unfavourable issue. With such different results it was naturally impossible to arrive at decided indications, and the professional opinion had to be formed ex juvantibus et nocentibus. Thus it has often occurred that patients after using the waters of Ems grew evidently worse, and at the expiration of the treatment, progressed to

their end more rapidly than would otherwise have been the case. At length, some daring spirits ventured to attack the infallibility of Ems in „affections of the chest“; partial opposition soon rose to decided contradiction, and doubts were expressed, whether Ems were at all serviceable in such cases. Several weighty authorities have even protested against the employment of Ems in many cases of chronic complaints of the chest, as for instance, *Helfft* (the Springs of Ems injurious in Tubercles of the Lungs. *Casper's* Wochenschrift. 1845. No. 34); *Albers* (Roisdorf or Ems. Medical Corresp.-*Blätter* of the Rhenisch and Westphalian physicians. II year. No. 13. 1843); *Nasse* (Patients returning from Ems or Wiesbaden. Med. Corr. Bl. of R. and Westph. phys. I. 6. p. 10), and the last named writer has in the same journal published a separate paper on the „want of truthfulness in the reports of cases cited in works on mineral waters.“ —

To remedy this state of things, to redintegrate the impaired credit of these wells, it is absolutely necessary that *exact diagnoses, anatomical diagnoses* should be made *in diseases of the respiratory organs;* and also, that the cases suited to Ems should be carefully distinguished, in order to prevent those for whom no relief can be expected, from losing the comforts of home and the attendance of their nearest and dearest friends. There can be no doubt that in many cases of Tuberculosis of the lungs Ems is able to effect a cure, but this is certain only so far, as we know of many cases of this description having been cured in general. On this point I refer the reader to my articles „On the treatment of Phthisis with Naphtha“, *(Neue med. chir. Zeitung.* Munich. 1847. No. 27) and „On the treatment of Tuberculosis of the Lungs with Urate of Ammonium“ (Jena Annalen, 1851. II. p. 362 etc.). But of this, more at another time. For the present let Em-

physema with its causative and dependent conditions be the subject of our consideration, especially as this disease so often receives the name of Consumption and is fatally *confounded with Tuberculosis*. But without the most careful and accurate physical examination of the chest a distinction of the two diseases is impossible; and yet this distinction is indispensable to the prognosis, on employing the waters of Ems.

In a very recent publication Mr. *von Ibell* alludes in the following words to these deplorable mistakes:

„The highly remarkable cures that have taken place here in such chronic complaints of the chest, have procured for Ems the reputation of a panacea against consumption in every form, and more particularly against pulmonary consumption. Such exaggerated reports have naturally raised expectations which were doomed to be disappointed; a reaction in the public feeling ensued, and our thermals have with

equal exaggeration been cried down as totally powerless in chronic diseases of the chest.“ —

Various other morbid conditions are also continually confounded with Emphysema, which they resemble only externally; in a pathologic anatomical respect, *Rokitansky* was the first to furnish materials enabling us to determine the true state of the case with great precision; and it is to *Skoda* that we owe the possibility of an exact diagnosis in order to distinguish it from bronchial catarrh, bronchial enlargement, and tuberculosis. This end is attained by inspection of the thorax, consideration of the whole habitus, by percussion and auscultation. It is not necessary to particularize the diagnosis; it is known to every physician who is conversant with the method of physical examination. I wish only to attach importance to the facts, that the signs given by *percussion*, — namely, when the liver lies lower than usual and the tone of the heart is more or less dull, — then the

heart itself is pressed or drawn downwards; and the signs afforded by *inspection*, — the peculiar conformation of the thorax, the strong development of the musculi pectorales, scaleni, sternocleidomastoidei, the low position of the diaphragm, the cyanotic hue, — are of incomparably greater weight than the signs of *auscultation*, which, for the most part refer only to the attendant catarrhs; but in their turn the auscultatory signs are of greater importance than others, such as dyspnœa, cough, expectoration, pain, asthma etc. —

As emphysema of the lungs consists in the atrophy of a portion of the organ, a radical cure or restitutio in integrum is not to be thought of. Neither is anything to be apprehended if the parts affected by atrophy be small in extent; the organism accommodates itself to the circumstances; but a perfect restoration of the organ to a state of integrity can only take place in the earliest stage, and will very seldom be

practicable, inasmuch as the development of emphysema is so gradual and imperceptible, that its beginning can scarcely be remarked. The destruction of a portion of the pulmonary substance can be supported without injury; here, of course, there are limits that must not be passed, if the morbid process is not to find in itself the cause of its continuance. For, in a case of atrophy of a part of the lungs, the vessels by which it was supplied are, as pathological anatomy teaches, destroyed by obliteration. This induces in the remaining portion a constant hyperhæmia, which is heightened by the supervention of external noxious principles. Should the atrophy and its attendant vascular obliteration be at all considerable, this alone is sufficient to keep up an abnormal secretion in the healthy parts. The process is exactly the same as in Bright's disease in which, on analogous grounds, hyperhæmia of the non-affected part is joined to excretion of albumen and fibrine.

But it is from these catarrhs, frequently produced by the most insignificant causes, that fresh dangers are continually to be apprehended. To remove these affections, as also the disposition to them, is the task imposed on Art; for, as before stated, a texture once affected with atrophy can never be restored to an integral state. *This task our thermal waters are capable of performing.* In other words: patients who have thus been cured of emphysema (of course imperfectly), may by attention and careful treatment be long preserved. — Even *Lænnec*, some time since, recommended the use of *alkalies* for the attendant catarrh. An additional requirement is a supply of pure, dry air unmixed with noxious matters, an end that is usually attained by the simple change from town to country air. A third object is, to augment artificially the contraction in the walls of the cells of the lungs, for which purpose the exciting air of a mountainous country is peculiarly

adapted. In the fourth place, patients of this description invariably suffer from abdominal infarctions, as a consequence of impaired circulation. *All these indications are answered by the soda-thermals* of our picturesque neighbourhood, where the air is pure, stormy weather almost unknown, and where sudden changes of temperature never occur. —

The *dry catarrh* of Lænnec, or the *humid asthma of the English*, the constant companion of emphysema, the cause of dyspnœa, always requires the exhibition of alkalies; and among these, carbonate of soda, a principal ingredient of our thermals, enjoys a well-deserved reputation, as it relieves the dyspnœa, promotes expectoration, and also diminishes the irritability of the bronchial nerves. A portion, at least, of the carbonate is taken into the blood. As this carbonate is of considerable importance to the animal economy the augmentation of it in the blood is an essential object, particularly to the

respiratory process; for it is one of the vehicles for the carbonic acid of the blood, which latter in emphysema is from mechanical causes only imperfectly oxygenated, as a damming up of the blood *before*, and stagnation *within* the right ventricle take place, whereby excentric hypertrophy of the right heart, stagnations in the whole venous system, imperfect oxydation, and cyanotic colour are occasioned.

Emphysema is particularly frequent in *persons of advanced* age, in which cases it is always joined to bronchitis or bronchorrhœa, and wherever these were wanting I never observed the so-called *Emphysema senile*. On such patients a course of waters at Ems works most favourably; and it is to this circumstance as well as to the restorative effect of the mineral on the activity of the skin (as we shall see when treating of cutaneous diseases) that Ems is indebted for its wide-spread name as a *restorer of Youth*.

In all the cases enumerated, mineral waters containing alkalic carbonates may be exhibited with the greatest advantage; among these the waters of Ems are distinguished and, as *Kreysig* observes, fulfil also all accessory conditions. But then physicians must not send their very worst patients hither, merely in order to disembarrass themselves of incurables! —

THE

THERMALS OF EMS

in

CUTANEOUS DISEASES.

On referring to the various publications existing on Ems, it will be found that in all of them these springs are reported to have rendered eminent service in diseases of the skin. These reports however are either at variance with each other, or are too indefinite in their tenor to allow of any *certainty* in drawing a conclusion as to the effect of our baths. —

Generally speaking, it is only in recent

times that cutaneous disease has been an object of special study. It is not so very long since it was denied that the skin was capable of independent disease. It was the School of Vienna, — which in all diseases searched after the anatomical basis, — and among them more particularly *Hebra*, who demonstrated, that the various cutaneous eruptions are just as much substantive disorders of the skin, as that Pneumonia is a disease of the lungs. This doctrine has produced an almost total revolution in the therapeutics of cutaneous maladies. The skin, being the outermost portion of the human body, is every where accessible; the remedies can be applied directly and may be immediately incorporated with the morbid part. For this reason, a preference has been given of late to outward medicaments, and on this subject I take the liberty of referring the reader to my papers in the following medical journals:

1) The abortive treatment of Erysipelas by Collodium. Deutsche Klinik, 1850, No. 36. —
2) Collodium in Erysipelas. Deutsche Klinik, 1851, No. 6. —
3) The abortive treatment of Erysipelas by Collodium. Deutsche Klinik, 1852, No. 8.
4) Collodium in Diseases of the Skin. Neue med. chir. Ztg., 1850, No. 28 and 1851, No. 9. —
5) Tinct. veratr. alb. in Pityriasis versicolor. Neue med. chir. Ztg., 1851, No. 16 etc. —

Among *external remedies*, baths and the various applications of water are those from which the greatest advantage may be derived. As a means in cutaneous diseases, it is more especially *alkaline baths*, — among those minerals that are accounted alterative, which have shown themselves *highly efficacious;* just as it is usual in ordinary practice to prescribe alkalies inwardly and outwardly, for which the grounds of proceeding are the acid reaction of the contents of the vesicles, or of the secretion in the morbid part

of the skin, a gouty diathesis with disposition to the formation of acid, and the like. The alterative effect is to be explained by the energetic operation of the alkalies on the crasis of the blood and by their diminishing the quantity of fibrine. Locally, they act upon the integuments, alteratively irritating on the subcutaneous cellular membrane, resolventlly saponifying on the epidermis; for which reasons they are most serviceable in chronic affections of the skin with inspissation, hypertrophy of the layers of the epidermis, and of the subcutaneous cellular membrane.

The following kinds of cutaneous disease may, in general, be regarded as proper objects for the thermals of Ems.

1) *Erysipelas habituale.* This is attributable to various causes. Either it is dependent on extreme irritability of the skin when, for instance, after inflammatory or œdematous erysipelas the swelling still continues, and finally degenerates to real induration and hypertrophy of the sub-

cutaneous cellular membrane: or, it is causally connected with inward disturbance of functions, especially with liver complaints and dyspeptic disorders; or, lastly, it is based, in persons of advanced age, on a state of general debility. In such cases the eruption disappears but slowly, scales off in small lamellæ, and the restoration to health is very gradual. Disturbances in the digestive functions, however, soon re-appear, and sooner or later there is a second attack, which is quickly followed by others. —

In the first form, in which the swelling remains after the inflammation and the disease threatens to become habitual, a course of baths at Ems promises a favourable result, provided these be joined to an internal exhibition of the waters and the use of whey. In the second case, it will be necessary to attack the original complaint, and, above all, the intervals between the paroxysms must be taken advantage of, in order to prevent the re-

turn of the malady. If the disease has not yet led to disorganisation, a course of waters at Ems in conjunction with a whey-treatment is indicated; and should individual cases of a hopeless nature not meet with a cure here, yet our mineral affords great relief and prolongs existence, particularly when the patient has learned to continue *at home* the regimen prescribed at Ems. Also in the third form Ems is in so far serviceable as it is, in general, looked upon as a means of rejuvenescence; which, however, can often be effected by merely regulating the digestion, and healing the lingering catarrhs of the chest and abdomen that so often occur in advanced age.

2) *Zoster.* This is a form of vesicular eruption which, beginning at some point of the vertebral column and encircling one half of the body, terminates at a lower point in front, but yet follows the course of that nerve which proceeds from the departing point of the eruption in the back. The vesicles ultimately dry up and

form a *crusta lamellosa.* — Relapses are not rare in this disease. Sometimes after the scabs have fallen off there is an intense burning and itching in the skin or the parts beneath; this after-complaint often lasts for weeks and months and, while it much distresses the patient, is not easily subdued by art. In dyscrasic subjects even obstinate ulcers are apt to form themselves, and these become cases of *chronic* Zoster. Against such relapses and sequels Ems proves as efficacious, as in the cases mentioned under No. 1. Both belong to the erysipelatous process.

3) *Pemphigus chronicus.* It appears sometimes in a single part of the body, and then chiefly at the extremities, sometimes in several parts at once and even over the whole skin; and on the round, red, isolated spots (accompanied with burning and itching) the epidermis rises in vesicles or pocks, at first small but rapidly attaining a considerable size. They are more or less painful, particularly at night, contain

an acid or neutral fluid, burst early, and leave ulcers or excoriations behind. The vesication often continues for years with different degrees of severity, and in this form seriously impairs the general health. The eruption is usually to be seen in all its stages, as fresh sets of vesicles constantly appear, which are even capable of inducing Hydrops and Marasmus. The disease is very apt to attack old people, and usually causes a sympathy of the mucous membranes; sometimes symptoms of Urodialysis appear. This is an indication to promote the renal secretions by alkaline mineral-waters, and to act on the morbid skin by exciting its activity through alkaline baths. These indications are completely corresponded to by the soda-thermals of Ems; and this so distressing as well as serious malady may here find a means of cure, of which also *Cazenave* gives a most favourable account. —

4) *Seborrhœa.* This disease consists in an augmented secretion of the sebaceous glands,

and offers a different aspect according as the superabundant sebaceous secretion comes to the surface of the skin or not, — remains liquid, or passes into a solid state.

These retentions of sebum take place more particularly at the period of puberty, as at this time the trunk of the hair becomes enlarged, and the thicker hair consequently impedes the free passage of the sebum. Hence arise frequently nodose efflorescences which in time grow hard and are covered with small scales; the little red nodosities then appear as separate infiltrated follicles in a dispersed form, and when a number of infiltrated follicles are close to each other, florid elevated surfaces are produced. At a later period they either form indurated red knots, or disappear with a purulent discharge as pustulous nodose and scab formation. Against this com-plaint our alkaline baths constitute an excellent remedy, inasmuch as they restore the lax tone of the skin to a normal state, — a fact verified

by the experience of *Moore Neligan.* A drinking-course of this water will also prove highly serviceable; and in such cases *Underwood* recommends, particularly for women at the age of puberty, the employment of alkaline carbonates. —

5) *Urticaria chronica.* The chronic nettle-rash may last for months or even years, appearing and disappearing at intervals, and occasioning much trouble both to patient and physician. The eruption is very apt to come out during the night, and causes the most violent itching. In some individuals there is a relapse of Urticaria after any gastric disturbance; an indigestion is sufficient to produce an attack. By a continuance of the malady the patient is often deprived of sleep and rest to such a degree, that a secondary condition ensues in consequence of the irritated state of the mucous membranes, emaciation etc. The attacks are frequently accompanied by alarming symptoms; even paroxysms of suffocation have

been observed. In rare cases, an affection of the mucous membranes alternates with cutaneous disorder; it has been observed, that when the exanthema receded from the skin, an intumescence of the mucous tunic of the mouth appeared in its place. A case of this nature is reported by *Alibert;* and according to *Elliotson* the tongue and fauces are often swollen to such a degree as to render it difficult for the patient to swallow or to breathe. — In treatment the gastric derangement claims pre-eminent attention; but in many cases all the endeavours of the home physician prove fruitless. A methodical treatment at our thermal wells, conjointly with a course of whey, a strict diet, and plenty of sound exercise, not only relieves patients from mental disquietude and the intense and insupportable itching, but frequently subdues this obstinate form completely. —

6) *Eczema chronicum.* This vesicular exanthema is of frequent occurrence and is distin-

guished by appearance of small bladders surrounded with a red areola, either situated on a normal non-infiltrated ground, or having a red enlarged base from which a drop of a limpid fluid continually oozes.

However different the various forms of Eczema, they all partake of this fundamental character, and are distinguished by the acute or chronic course of the disease. Chronic eczema is one of the most obstinate and troublesome of disorders; it sometimes extends over vast tracts, attacks children as well as grown up persons, and spares no part of the body. Should it fall on the hairy portion of the head, a continuance of the disease produces Trichoma spurium; if it becomes localised in the face, Porrigo larvalis ensues; in the extremities it produces the famous *salt-fluxes* of former times. The infiltration of the skin is sometimes so considerable as to occasion the disorder to be confounded with Elephantiasis or Ichthyosis. These eczemas

bear, as *Virchow* has truly remarked, a great resemblance to diseases of the mucous membrane, as is evident in affections of the conjunctiva, and furnish proper cases for alkaline baths, and specially for Ems, where baths and douches effect a cure. (*Devergie* also refers to baths with carbonate of soda as particularly efficacious in such cases.)

Neither during nor subsequent to the healing process, however rapidly conducted, does eczema ever exhibit any of those metastases formerly so much dreaded. It is here proper to observe, that *Hebra* lately asserted that he, as well as *Hamernik*, had during the course of 10 years taken all possible pains to produce metastasis by the suppression of cutaneous eruption, but without success. As was formerly the case with most chronic cutaneous eruptions, the present disorder too was ætiologically considered according to the humoral-pathological ideas of venosity and stagnation, mucous obstruction, infarctions,

and accumulation of excrementitions matter, and all diseases and symptoms were to be disposed of by the evacuating method, if they could possibly be derived from these abdominal and crasic alterations; or if it was wished to open a porta malorum for *critical* alvine evacuations, in the genital mucosa; in the kidneys etc. —

7) Among the papulous forms of cutaneous disease *Lichen chronicus* is that which is most successfully combated by our alkaline baths. Itching of the skin has always been looked upon as one of the diseases calculated to find a cure at Ems. *Tabernæmontanus* in 1593 says of the wells of Ems, that they drive away also itching of the skin, and tetters; *v. Ibell*, 1851, particularly commends them in pruritus vaginæ when in the form of a purely nervous complaint. Itching of the skin, however, is a symptom that belongs to a number of cutaneous diseases, as Lichen, Eczema, Prurigo etc. but is more especially the concomitant of papulous eruptions, in

which a never failing symptom is intense itching. Lichen consists of red pimples with a scale at the point; these generally appear in repeated eruptions, and often cover the whole skin. At length the skin degenerates, it becomes chapped and of a sooty hue, the burning and itching continue without pimples and scales being formed; the skin is as if covered with dust; by the continual itching, by the repeated eruptions and the deprivation of all rest at night, the whole organism is at length affected. With remissions and exacerbations the disease often lasts for years, and then acquires a resemblance to Psoriasis, with which however it must not be confounded. The causes are as yet involved in obscurity; depressing emotions, faults in diet, excess in the use of spirituous liquors, and especially irritability of the skin, may be looked upon as exciting agents; in tropical countries the disease is very general. — Our alkaline warm baths are peculiarly adapted to the treat-

ment of this lichen chronicus. *Rayer* speaks favourably of alkaline salves and baths in very inveterate cases; *Alibert* also prefers baths to other external remedies, and *Cazenave* considers carbonate of soda as such a *specific* that he has introduced a particular formula for artificial baths of this kind. They undoubtedly prove highly beneficial in Lichen, and afford temporary relief in Prurigo; but the cure of this latter malady is a great rarity; the efforts of the most eminent practitioners are often vain against this disease, which neither our baths, nor the cold-water cure, nor arsenic are capable of healing. Therefore, the itching of the skin that may expect a cure at Ems is only Lichen, which is to be distinguished from Prurigo, 1) by the pimples which in the former are *red*, in the latter, of the same colour as the skin and on being scratched away discharge a great quantity of serum; 2) by the swelling of the glands about the groin, presenting a bubo and always met with in Prurigo.

With regard to the distinction of Lichen from Scabies, the peculiar animalcula of the latter furnish a sure diagnosticum; — neither Prurigo or Scabies is amenable to the forum of Ems.

In persons advanced in years, who in general are apt to be affected with chronic cutaneous eruptions, there occurs a kind of itching to which the name Prurigo senilis has been given; it may be looked upon as a species of lichen, but is mostly accompanied by gastric phænomena. These troublesome diseases frequently occur in such subjects from a derangement of functional activity in the skin, by which vegetative life is prejudiced. Such patients return from Ems provided, as it were, with a stock of youth, and have often reason to be grateful to the *restorative virtues* of our springs, for the enjoyment of many additional years of life.

Nothing acts so beneficially on advanced age, nothing is so calculated to give fresh life to the expiring flame, as a drinking and bathing

course at Ems, more especially after several weeks preliminary treatment in Schlangenbad. —

Although, however, our springs exhibit an admirable efficacy in the radical cure or partial improvement of chronic exanthema, yet we must not over-rate their therapeutic value. Nevertheless, this operation of the waters of Ems well deserves serious attention, for the mildly alterative baths are peculiarly adapted to those cases, in which an energetic local treatment scarcely appears indicated.

In the publications that have till now issued from the press, the value of Ems in this respect has been almost totally disregarded; but within the last few years I have had repeated opportunities of observing cures of chronic cutaneous diseases, that had for years obstinately resisted the most consistent general and topical treatment; on which point I refer to my article in the Russian Medical *Zeitung*, 1852, No. 8,

„on the efficacy of the Thermals of Ems in cutaneous diseases.“ —

It is to be considered a favourable sign, when during the employment of the baths a stronger eruption, a momentary aggravation of the exanthema takes place. As a rule, this exacerbation is followed by a speedy and lasting disappearance of the exanthema, without any prejudice whatever to the organism. —

THE

NATURAL WARM UTERUS-DOUCHE

AT EMS.

The far-famed „Bubenquelle“ at Ems is a natural fountain encircled by a basin, and fed by one of our thermal springs. Through a small metal tube fixed in the bottom of this basin a jet of water about five lines in diameter, three feet in height, and possessing a temperature of 86 — 7° Fahr., spouts upwards with such impetuosity, that the spring in twenty-four hours discharges 957 cubic feet of water. The specific

warmth amounts to 1,0043, the spec. gravity at 55° F. 1,0032. The chymical composition is quite similar to that of the other springs of Ems: 1 pound = 7680 grains, evaporated at 212° F. gives a residuum of 21,402 grains.

The spring in question, (though not mentioned by *Weigel*, 1627, and even later writers) has for a considerable period been successfully employed in several disorders of the female genitals; and superstition, speculation, and charlatanry having ascribed to it peculiar virtues against sterility, the supposed specificum has been, and is, frequently resorted to without special medical advice. This has led to much harm, both morally and physically, for which reason several writers on these Thermals look not with a favourable eye on the *douche ascendante*, and have even gone so far as to express their doubts of its being useful for any purpose whatever. In consequence of these expressions of opinion the Bubenquelle fell somewhat into discredit, and

was even made the subject of considerable ridicule.

But in recent times the efficacy of the *uterus-douche* has been almost universally recognised and, as a natural consequence, the rights of our Bubenquelle which had so long previously been employed as a *douche ascendante*, could not be overlooked (v. my article in the allgem. med. Centr. Zeitung, 1852, No. 45.). The efficacy of the Uterus-douche is a most important fact for Gynæcology, and, it being indisputable that *our thermals bear a special relation to the uterine system*, that they exercise *direct influence* on menstruation (the menstrual flow generally becoming more copious and the discharged blood assuming a more liquid character), it naturally follows that a uterus-douche, like ours, composed of a mineral water possessing an abundance of volatile and penetrating elements, such as carbonic acid gas, must act upon the female organs of generation with peculiar efficacy. And this

is the case; against such disorders of the uterus as *induration* and infarction, other than *topical remedies* can be of no avail; a proposition that is supported by the important opinions of *Chiari* in Prague and *Simpson* in Edinburgh, and in favour of which my late lamented friend *Kiwisch* was particularly encomiastic. — If we take a general view of the effects of our warm uterus-douche, it will be found that, in the majority of instances, considerable congestion to all the organs of the pelvis, besides a softening and intumescence of the parts immediately acted on, was produced; and this effect differed in intensity, accordingly as the individuals were more or less irritable or torpid. While in irritable subjects the application of a vigorous warm douche to the mouth of the womb augmented the secretion and often produced bloody discharges in a short time, — there was in torpid cases at the commencement only a sensation of fulness and uneasiness in the region of the pelvis. Irri-

tating, however, as our warm douche is in pathological diminished congestion to the uterus, yet in neuralgic conditions, in many cases of dysmenorrhœa and in uterinal colic, its operation is in an equal degree soothing and sedative. —

From these few general remarks, the special indications for the following cases may be determined. (The property of exciting throes is here passed over.)

1) Torpid Amenorrhœa, not dependent on Hydræmia. —

As it is not every kind of Amenorrhœa that is suited to our waters, it will be necessary to determine the form. When amenorrhœa is connected with tardy development of the whole body, is produced by sanguineous dyscrasy, or proceeds from Hydræmia (Anæmia, Spanæmia); when it makes its appearance in consequence of pathological processes which exercise a powerful influence on the vegetative activity of the whole organism; should the cause

be imperfect formation or development of the generative organs, or premature involution, — such patients do *not* afford an object for treatment with the waters of Ems. Should, however, Amenorrhœa be dependent on Plethora, the prescription of a mineral course at Ems must be considered as perfectly advisable. By a continued use of our waters the necessary degree of liquidity is produced in the blood, while by an appropriate diet, exercise in the open air, and the use of whey and warm baths, a more copious flow of blood to the uterus is effected. Here it is that our warm douche acts so efficiently in promoting the secretion of the matrix.

If Amenorrhœa is a consequence of defective innervation of the sexual system, such as is observed attendant on habitual excess in venereal pleasures, frequent deliveries, sterility etc., and which in many instances offers an analogy to the impotence of the male, and is usually combined with general torpor of the nervous system, —

in such cases local excitement of the genitals is of the utmost importance, and our natural douche will be found to render excellent service.

Amenorrhœa arising from chronic diseases of the uterus, especially from chronic Metritis, and particularly when the latter is connected with induration of the tissue, will be mentioned below.

2) *Menstruatio vicaria*, in which by suppressio mensium hæmorrhage in another organ takes place. —

The main object of treatment in *secondary amenorrhœa* (suppressio mensium) must of course be to re-establish menstruation. The causative external agents are principally cold, nervous impressions, dietetic irregularities etc. In consequence of this Menostasia appearances of congestion to the head, lungs etc. manifest themselves, and frequently give rise to hæmorrhages from the nose, air-passages, stomach, intestinal canal etc.; the diseases of other organs become

aggravated, and the patient is moreover troubled with all sorts of nervous attacks, and particularly with colic. It is, however, exceedingly difficult to form a judgement on this causal connexion, for amenorrhœa is just as often the consequence of the other disease. — Wherever circumstances allow, the course of treatment ought to be so adjusted as to coincide with the catamenial period. In the chronic form of the malady, removal of the exciting causes is an essential requisite. In these cases, too, we may expect the best assistance from the use of the warm douche, which effects not only a beneficial diversion to the uterus, but also a profuse and general perspiration; this, if kept up by the patient's remaining in bed, is always followed by relief and improvement, and above all it moderates and removes the violent uterine colics. —

Should Amenorrhœa be owing to the *substituted secretion* of *one or more organs*, ex. g.

habitual periodic hæmorrhages, large purulent surfaces after operations, burns, ulcerations and the like, then the principal intention of the curative process will be, vigorously to incite the womb to secretion. For this purpose nothing can be better than our *warm douche*, — the employment of which in similar cases has been frequently attended with the most happy results, — together with the use of foot and vapour baths, and clysters. Should the vicarious activity not be of recent date, it is not likely that our attempts to regulate the morbid condition will be at once successful; unfaltering perseverance in the therapeutic course is imperatively called for, and after the cure, careful supervision of the catamenial periods becomes necessary. It need scarcely be observed, that a *restriction* of the vicarious function should go hand in hand with the excitement of the uterus. In chronic complaints of the mucous membrane, or in purulent surfaces Ems is abstractedly, a remedy that

cannot be too much praised, so that these thermals may be said amply to fulfil all indications, and to afford the most reasonable prospects of ultimate success. —

3) *The chronic form of infarction and induration of the uterus.*

For this complaint, there is no curative agent that deserves to be put in comparison with the natural douche of Ems. — In such cases our waters, conjointly with the warm douche, are in the highest degree serviceable, especially when the chronic form of accumulation and induration is united with Amenorrhœa, Dysmenorrhœa, or with scanty menstruation. *No other remedy* is capable of softening the indurated texture to the same degree within the same period of time. When the congestive appearances in the diseased tissue have ceased, the more anæmic the indurated part becomes, the more will the therapeutic intention be, to enhance the vascular activity of the uterus, in

order thereby to quicken the metamorphosis of the diseased part. It is to be remarked, that here a sense is attached to the words *accumulation* and *infarction*, very different from that in which they were formerly understood. — Among the most effective topical remedies, we may reckon an energetic and continuous use of our uterus-douche. The more torpid the individual, the more considerable the induration, the more obstinate the dysmenorrhœa or amenorrhœa, the higher must be the degree of warmth, the stronger the jet employed. In advanced affections of this nature the remedy must be applied daily for weeks together, before the desired effect is attained; the greatest patience is indispensable both in patient and physician.

For the subsequent treatment of these cases a lengthened exhibition of iodide of potassa, with interposition of laxatives, is to be recommended. Should a chlorotic condition be developed, the iodide and carbonate of iron are to

be employed, and for this purpose the chalybeates of Schwalbach are particularly suited, and in many instances sea-bathing will be advisable. If the induration be atonic, and the subject torpid, the nutriment should be abundant and slightly stimulant; nor should fresh air, bodily exercise, and a cheerful tone of spirits be neglected, in order that a general and beneficial influence may be exerted on the vegetative powers; — an object that cannot fail to be forwarded by a change in the mode of life, as well as by the favourable climatic circumstances of our bathing-place. —

4) *Neuralgic Dysmenorrhœa* and *Uterine Colics.*

The fourth form in which our douche is advantageously exhibited is, in neuralgic dysmenorrhœa and several forms of uterine colic. Relief from pain and a feeling of ease are a general consequence of the application of the douche in these diseases, so that the patients

willingly submit to its employment and themselves request a repetition. Among the different forms of dysmenorrhœa, that to which the term of *nervous* is applied is here more particularly referred to. It is always the consequence of an insufficient innervation and is accompanied by anomalies of the organs of motion and sensation, the phænomena of which are in the highest degree varied.

The attacks generally occur before the period of menstruation. With respect to relief from pain and promotion of the sanguineous secretion, our warm Uterus-douche affords the speediest means of succour. The same remedy is likewise attended with the most brilliant results in the *congestive* form, when the catamenial secretion is delayed, while there is unmistakable congestion to the organs of the pelvis and abdomen. But if, on the other hand, there should be general vascular excitement with ebullitions of blood towards distant organs, or a disposition to in-

flammation, the douche is to be avoided. — In both cases, the preservative course of proceeding between the catamenial periods will consist in a methodical use of our waters, internally and externally; by which the chronic catarrh of the uterus (generally the most important complaint), the concomitant hysterical affections, and also the infarctions are most likely to be eliminated. —

In addition to these causes, difficult menstruation is also attributable to *defective organisation of the uterus*, as well as to various diseases of that organ, and thus we find the most tormenting and obstinate dysmenorrhœas attendant on chronic infarctions, fibroids, deviations, inflammations, contractions of the orifice of the womb, carcinoma etc. In such cases, wherever radical treatment is not possible, a symptomatic course of proceeding must in general be observed. Here again the best remedy, particularly for sensitive subjects, will be a mineral course

at Ems in conjunction with the warm baths, and in special instances, the warm douche. —

As counter-indications of our douche are to be regarded, all forms of Metrorrhagy; active, inflammatory conditions; softening and relaxation of the tissue of the uterus; and the state of pregnancy (on account of its tendency to excite throes); neither does the same degree of warmth suit all cases. In order to satisfy the requirement of a different temperature, two douches ascendantes with natural thermal water have, at my recommendation, been introduced; in these, height of the fall, the disposition, strength, and warmth of the jet may be regulated at pleasure. One is situated in the upper wing of the old *Kur*-house; the other, in the neu Bath-House. —

5) *Blenorrhœa of the Uterus.* In this disorder our first investigations will be directed to the anatomical state of the uterus, for the warm douche can only be recommended in those cases in which an increase of the congestive

state is desirable, as often occurs in amenorrhœa and vicarious blenorrhœa in chlorotic subjects, in atonic induration and viscous and scanty secretions. Even primitive blenorrhœas of the uterus manifest their pernicious influence on the total organism, and assume a character of dependence on the latter, that is not to be overlooked. In the majority of blenorrhœas, therefore, in addition to the topical treatment a general therapeutic procedure, modified according to the constitution, will be necessary. A *total change* in the mode of life by a methodical course at our stimulating solvent springs will allow of a favourable prognosis in the primitive forms of this distressing and loathsome complaint. —

With regard to vaginal injections or ordinary douches of the external genitals, in the majority of instances they replace but inefficiently the uterus-douche, although in many complaints of the female generative organs they are of great use.

All arrangements of this nature with ordinary warm water are, though practicable in private practice, nevertheless connected with considerable difficulties. But here in Ems the warm douche, with its fixed and volatile components, issues at once from the ground; and in the inward and outward use of the waters, in the climate, in the fresh air of our beautiful and genial valley, patients find the means of effecting a general alteration of the vegetative powers, and also by frequent exercise in these romantic environs, of attaining a cheerful and healthy tone of spirits, so necessary to this description of invalids. These beneficial influences are by no means to be disregarded; for removal from domestic circumstances, the excitement of travelling, change of diet, air, etc. etc. are all *indispensable* accessories to the principal treatment, the main object of which is, to act alteratively on the whole organism. —

That the diseases mentioned above are ca-

pable of preventing conception, is a well-known fact, and that Ems is capable of *removing sterility* (in many cases) is beyond doubt. Should this end not be attained by the ordinary employment of the waters, there yet remains that all important remedy, the warm uterus-douche, the Bubenquelle. How often is not the enlargement (with or without operation) of the orifice of the womb recommended against sterility, the smallness of this opening being often the cause of unfruitfulness, whether organic or spasmodic. But is our mollifying warm uterus-douche not to be preferred in such circumstances? —

It frequently occurs that a morbid constitution of the uterine secretion produces an acid re-action. *Donné* has observed that this acid composition of the vaginal mucus is destructive to the spermatozoa of the semen; he states that, after repeated observations he has arrived at the conviction, that a woman *with an acid uterine secretion is not likely to conceive.* Can a more

effective means of cure be found than in a regular course of the thermals of Ems, the principal operation of which is universally recognised as „acid-destroying.“ —

Considering it the duty of a physician at a mineral to determine the indications as accurately as possible, the writer hopes by the above remarks, to have vindicated the well deserved reputation of the natural warm douches of Ems as curative agents in uterine disease. —

THE

SPRINGS OF EMS

IN

DISEASES OF THE LIVER.

Ems is a milder Carlsbad. —
Kreysig.

The strong alkaline thermals of Carlsbad have till now possessed an almost exclusive right to be considered as a panacea in all complaints of the liver, and this more particularly since a few cases of cancer, in which the diagnosis had been formed by *Oppolzer* and was beyond all doubt, have there met with a cure.

But besides these, we find recorded some very remarkable cases of chronic complaints of the liver and the gall-bladder, such as Hyperhæmia, Stasis of the bile, Icterus etc., which exhibit most decisively the curative powers of Carlsbad in these diseases. The great efficacy of this water is owing to its richness in alkalies and neutral salts; these make it one of the strongest resolvent and purgative remedies. It is not the intention of the present lines to enter into competition with Carlsbad, but merely to direct attention to the point, that the *warm soda-springs of Ems also offer a vigorous remedy in certain affections of the liver*. Unfortunately, diseases of this organ, although so frequent, are as yet so little known, that the diagnoses are most difficult, often only general or symptomatic, often only approximative and according to probability, and in some instances it is absolutely impossible to refer symptoms to the correct causes. It is, however, a generally recognised fact, that, in various

diseases of the liver, courses of mineral waters are to be recommended. It therefore becomes particularly incumbent on the physicians of watering-places to specify, as precisely as possible, the forms suited to one or the other spring; and this, even if there were no other object in view than that of sparing the patient the fatigue and expense of a fruitless journey. We are now all aware that Carlsbad proves eminently serviceable in certain disorders of the liver and, referring to the declaration of *Kreysig* at the head of this chapter, we may be allowed to expect in Ems a certain similarity of effect with the above named Bath. And it is undoubtedly the case that the waters of Ems are well qualified for employment in certain liver diseases, and in the following lines it will be my endeavour to specify the cases in which Ems has already been used with the *most favourable results*. (v. Wiener med. Wochenschrift 1852, No. 43.) — Two peculiarities of our waters

are in a therapeutic point of view especially worthy of note: firstly, the total effect of the waters in chronic catarrh generally; and secondly, the quantity of bi-carbonate of Soda they contain. —

The principal effect of a mineral treatment at Ems, both internal and external, is to cure chronic catarrhs in general, whether such are seated in the mucous surfaces of the respiratory, digestive, urinary, or generative organs. (On this subject I beg to refer to my discourse at the 29. meeting of German Physicians and Naturalists, and to the *first* edition of the present little work, Wiesbaden 1853, as also to a paper in the „Deutschen Klinik“ 1852, No. 24, „On the Thermals of Ems in Emphysema of the Lungs.“) Chronic catarrh or inflammation of the mucous tunic of the stomach and small intestines, is also healed at Ems. But how often are not liver-complaints in connection with these catarrhs? Very frequently a hyperhæmia of the

duodenum extends to the lining tunic of the choledoch duct. In mild cases it passes away as a catarrh, in severe ones, as an inflammation with exudation on the mucous surface. The gall-bladder, common biliary duct, hepatic and cystic ducts, and even the minute biliary branches, being lined with a mucous tunic, or at least with a membrane resembling the mucous coats, are all subject to the affections of the mucous system, and by the reciprocal influence of diseases of the liver on each other, these affections appear to extend to the parenchyma of the liver. Thus we have in the liver, physiologically, the same system in anatomically uninterrupted connection, as in the stomach and duodenum; the mucous membrane of the biliary apparatus is histologically the same as every other mucous coat, and consequently subjected to the same disorders. And as Ems cures the chronic catarrhs of the other mucous mem-

branes, so does it also cure *those of the biliary passages.* —

Although disorders of the mucous membrane, of the gall-bladder and biliary ducts are of frequent occurrence, yet on account of the inaccessibility of the organ and the confined nature of its function, the forming of a just diagnosis is rendered exceedingly difficult, inasmuch as the symptoms presenting themselves in liver disease, are all more or less ambiguous. But a careful study of the circumstances usually attending the morbid forms in question, will enable us to conquer the difficulties of making a minute diagnosis. *(Budd, Schuh, Oppolzer, Henoch,* etc.*)* —

The proximate cause of most affections of the gall-bladder and the biliary ducts is, without doubt, the passage of an irritating bile, or mechanical irritation from gall-stones; but, on the other hand, a catarrh may also occasion an inflammation of the gall-bladder, a variety of

structural changes, inspissation, ulceration, enlargement of the gall-bladder, which can often be felt as a tumour, obstruction of a biliary duct; by any of which contingencies a number of symptoms are called forth.

Several observers have found chronic inflammation of the gall-bladder and biliary ducts as one of the morbid changes ensuing *after remittent fever*. Thus *Blane*, in his report of the fever in the island of Walcheren, remarks that the mucous membrane of the gall-bladder was frequently inflamed and ulcerated. The bladder was usually found distended with a gall that neither tasted bitter nor turned water yellow, but was so pungent as to produce excoriations when applied to the lips. *Boyle* on dissecting subjects who had died of fever at Sierra Leone, found almost always traces of inflammation in the portio pylorica of the stomach, which continued along the duodenum as far as the point of entrance of the biliary duct; the ductus chole-

dochus was generally obstructed with viscous dark-coloured gall. Also in the yellow fever that in 1821 raged at Barcelona, signs of inflammation of the gall-bladder often showed themselves. In these parts ulceration of the gall-bladder is not unfrequently based on irritation through biliary calculi, or on a morbid alteration of the biliary secretion. In the course of *typhoid* fever a suppurative inflammation of the mucous membrane of the gall-bladder is sometimes developed, and *Louis* has reported several cases. The mucous tunic becomes thickened and gives rise to sequelæ. The same has been observed in Cholera and other malignant diseases. Should the inflammation and tumefaction be inconsiderable at the commencement, the symptoms are easily overlooked, on account of their insignificance. But if the primary ducts, and still more the choledoch duct, should be inflammatorily affected, obstructed, the flow of bile impeded, we shall soon observe pain in the region of

the gall-bladder, nausea, vomiting, and jaundice; and should the inflammation increase to such an extent as to close the duct. chol. the pain will be confined to a part corresponding to the position of the duct, icterus soon appears, and the gall-bladder, being considerably distended, assumes the form of a moveable, pear-shaped, painful tumefaction under the false ribs. —

The spasmodic icterus of authors is usually based on catarrh of the biliary ducts, and by this the narrow passage is easily obstructed, both through the swelling of the mucous membrane and the tenacious nature of the mucus secreted. The complaint formerly known as Hepatalgia is to be referred mostly to the same cause, the existence of purely nervous pain in the liver having in recent times been subjected to considerable doubt. —

As the majority of the diseases of the biliary passages treated of in this chapter are referable to a defective quality of the bile, we

may naturally infer that those remedies likely to produce a favourable change in the composition of this fluid, are those calculated to be most serviceable in such cases. Among these remedies the sanative springs of Ems occupy an important place. After an abundant supply of water the quantity of secreted bile is increased, not only with respect to its contents in water, but also in solids. After much water has been imbibed, the bile, it is true, is richer in water than the normal bile, but with this water more solid parts are secreted than usually proceed from the liver *(Bidder, Schmidt, Nasse)*, and the carbonate of soda is found in the bile *(Lehmann)*. Preparations of soda are celebrated as cholagogues, and seem to deserve their fame; especially in the combination of our springs internally and externally. Physiological considerations led us to expect that they would be pre-eminently serviceable in catarrhal inflammation of the biliary passages. Soda is naturally

a constituent of the bile, and is doubtlessly excreted with facility by the liver; it dilutes the viscous mucus of the gall-ducts, thus acting as in catarrh of the lungs, in which alkalies have long been used as expectorants. Observations made by many eminent practitioners have caused soda to be esteemed as a valuable remedy in these diseases, and this circumstance cannot but speak in favour of a drinking and bathing course at our wells. —

We have as yet had our attention confined to the subject of catarrh; we now come to another class of diseases in which the thermals of Ems are to be considered in a chymical point of view and with regard to the effect of their bi-carbonate of soda. —

First among these, we may enumerate *Biliary Calculi.* Here three intentions are to be kept in view; 1, to alleviate the pain and cramp during the passage of the stones through the biliary ducts; 2, to dissolve the stones remaining

in the gall-bladder; and 3, to prevent the formation of fresh ones. To answer the first indication, since *Prout's* time the most effective of all remedies is considered to be copious imbibition of a thermal soda water conjointly with baths of the same, such as we find at Ems. The alkali removes the troublesome symptoms arising from the acid of the stomach, whilst the warm water acts directly on the seat of pain. With regard to the second indication, alkaline carbonates enjoy considerable credit, and it is endeavoured to explain their effect by the easy solubility of cholestearates of potass and soda. But it seems improbable, that stones once formed in the gall-bladder can be resolved. The fulfilment of the third intention is the most difficult. Every impediment to the evacuation of the bile disposes to gall-stones, and such impediment is generally created by catarrh, constriction, and obstruction of the biliary passages. That Ems is effective in such instances,

has already been observed; and purgatives share the employment of the *warm baths* as secondary remedies. If, however, the patient should be weak and emaciated, the *alkaline carbonates* will demand a preference to more powerful remedies, as from these carbonates used inwardly and outwardly the most excellent effects have been observed in cases of protracted disturbance of the biliary secretion. With respect to these complaints, Ems deserves the reputation it enjoys.

As to what regards the quantity of the bile, there exists a redundant biliary secretion, chiefly found in those persons who are exposed for the first time to a hot climate; thus this redundancy is frequently met with in Europeans *living in India.* In our climates it occurs in such individuals as have led an indolent, luxurious life. Such persons suffer for a lengthened period from what is termed a *bilious state,* which manifests itself by a sensation of fulness

and weight in the region of the liver, icteric hue of the skin, nausea, bilious diarrhœa, head ache, furred tongue, and turbid urine. This condition has been designated by the terms Status biliosus, Dyspepsia biliosa, bilious Saburra, Polycholia, Jaundice, Atra Bilis etc. When the complaint lasts long, the patients become much debilitated, sullen, irritable, hypochondriac, and emaciated. We do not indeed know what chymical change this abnormal bile undergoes; but experience has shown that copious draughts at our warm soda-springs, combined with the baths, are highly advantageous, and with interposed saline purgatives generally restore the patient to health.

It is but seldom that the bile has been found to be acid, and if here and there an exception to the rule has been met with on dissection *(Budd, Solon, Scharlau, Gorup-Besanez, Lehmann)*, or in the above-mentioned epidemic in Walcheren *(Williams)*, yet these

cases are too isolated to be made the basis of a curative proceeding. —

A disease of very frequent occurrence is *Fatty Liver*, fatty infiltration of the liver. This disease is often found accompanying Tuberculosis of the lungs, and in persons accustomed to a full and rich diet, who are of indolent habits, and apt to indulge in spirituous liquors, and particularly in strong beer. But it is sometimes in consequence of acute disease that the hepatic organ assumes a state of fatty degeneration, ex. g. after the yellow fever, or the severe remittents of the tropics, — diseases which, without producing inflammatory phænomena, may exert an injurious and lasting influence on the structure of the liver. The latter is, in such cases no longer capable of performing its functions so energetically as before. There is also great probability that protracted mercurial treatments lead to similar results. The frequent occurrence of fatty liver in phthisis enables us to

recognise this complication during life. When in a phthisical subject we meet with a considerable, painless turgescence of the liver, *without ascites,* we are justified in presuming the presence of fatty degeneration.

In children fatty liver often appears independently of Tuberculosis, after variolous maladies, measles, typhus, and scarlatina.

We may then observe a bloodless, semi-transparent, wax-like condition of the skin, especially visible on the face and back of the hand, less so on the trunk. To the touch the skin appears relaxed and withered, and sometimes as smooth as satin. This state perfectly resembles the cachectic condition that often remains behind after intermittent fever, and in which dyspepsia, diarrhœa, intumescence of the liver, polycholia, cardialgy, acid eructation, and the like, continue for a considerable period.

The *utility of Ems in the above-stated forms cannot be doubted.* In tuberculous patients

I have often observed that, after the mineral course, the swollen liver was reduced to its natural size; and it is certain, that our springs by their healthy action on the liver (perhaps by saponifaction of the fat?) and by removing the chronic catarrh of the stomach and duodenum of tuberculous subjects, essentially contribute to a *constitutional improvement of consumptive persons*. The diarrhœas so injurious in tuberculosis are most probably to be attributed, at least in part, to a fatty degeneration of the liver; it having been found in a case of incurable diarrhœa in a tuberculous patient, that the intestinal mucous membrane presented no pathic changes, and that only fatty liver was discoverable *(Rilliet)*. When fatty liver appears as a sequela of severe diseases, a copious internal use of our water, together with baths, a prolonged residence in our excellent climate, and appropriate diet, cannot be too highly recommended. Should the disease be the consequence

of a luxurious way of life, a suitable diet will be an essential condition to improvement, and our natron waters will then be able to effect a better nutrition, to remove disturbances of the digestion, and to produce an augmentation of general strength.

In hypertrophia hepatis founded on a scrofulous basis (Rokitansky's Speckleber), strong purgatives are to be avoided, while the imbibition of a fluid containing a quantity of soda, (Ems) is highly serviceable in promoting the biliary secretion. In chronic inflammation of the liver, cirrhosa, granular degeneration, and atrophy, the waters of Ems are not at all adapted to curative purposes.

ANALYSES OF THE FOUR PRINCIPAL SPRINGS OF EMS,

FROM THE LATEST INVESTIGATIONS, 1851, BY Dr. R. FRESENIUS AT WIESBADEN.

A Pound of water equal to 7680 grains, contains

Temperature Specific weight (12° C.)	Kessel-brunnen 115° F. 1,00310	Krähn-chen 80° F. 1,00293	Fürsten-brunnen 94° F. 1,00312	New spring 118° F. 1,00314
Bicarbonate of Soda	15,19749	14,83760	15,60315	16,07055
Sulfate of Soda	0,00614	0,13778	0,15506	0,10790
Chloride of Natrium	7,77055	7,08411	7,55098	7,27020
Sulfate of Kalium	0,39337	0,32863	0,30144	0,43653
Bicarbonate of Lime	1,81294	1,72462	1,77608	1,79090
Bicarbonate of Magnesium	1,43608	1,50513	1,53576	1,61963
Bicarbonate of Iron	0,02780	0,01666	0,02035	0,02388
Bicarbonate of Manganese	0,00476	0,00722	0,00607	0,01198
Bicarbonate of Barytes Bicarbonate of Strontia	0,00369	0,00115	0,00215	0,00262
Phosphate of Alumina	0,00960	0,00322	0,00338	0,01090
Silica	0,36480	0,37978	0,37778	0,37839
Carbonate of Lithium	traces	traces	traces	traces
Iodide of Natrium	"	"	"	"
Bromide of Natrium	"	"	"	"
Gross weight of solid ingredients	27,02722	26,02590	27,33220	27,72348
Free carbonic acid	6,78866	8,32497	6,92751	6,08893
Gross weight of all the ingredients	33,81588	34,35087	34,25971	33,81241

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MDZ Münchener DigitalisierungsZentrum Digitale Bibliothek

Spengler, Louis

On the Effects of the Thermal Waters of Ems by Louis Spengler

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